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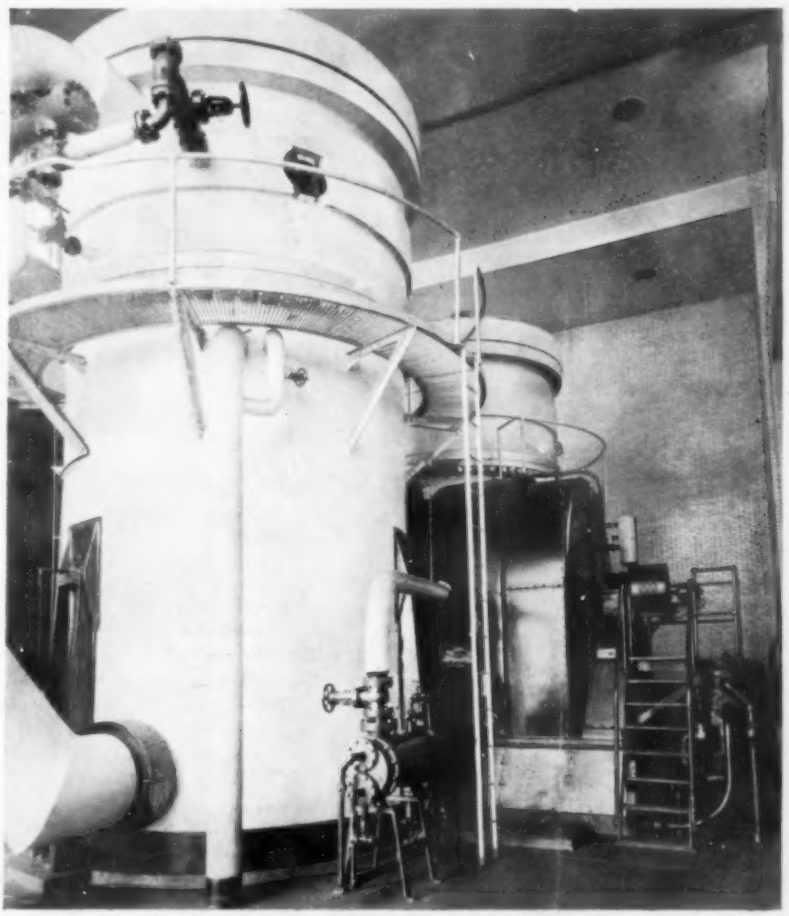
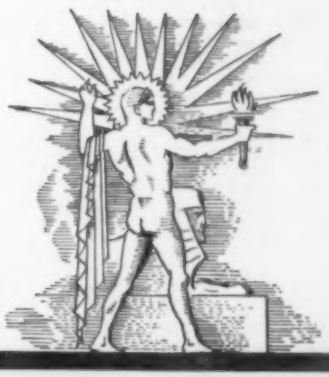
SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •





JUNE 27, 1931

Boiling Mercury to Make Electricity

See Page 415

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SCIENCE NEWS LETTER

VOL. XIX *No. 533*

The Weekly Summary of Current Science

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DO YOU KNOW THAT

There are now more than a million big-game animals in the U. S. National Forests.

The dandelion, a native of Europe and Asia, has been naturalized in all temperate countries, where it crowds out much of the native flora.

Canada geese nest farther south than any other North American geese.

An apparatus for measuring the warmth of an overcoat has been devised.

Sir Arthur Keith, noted British anthropologist, has said that before men learned to be farmers the world's population could scarcely have exceeded 10,000,000.

A simple chemical test to show whether a potato will make good potato chips has been developed by government scientists at the request of chip manufacturers.

An improved machine for sorting cotton fiber is able to measure fiber lengths with great accuracy.

The Grenfell Northern Labrador Charting Expedition has set out on a three-month's cruise to map and chart the 200 miles of the northern Labrador coastline.

Moth balls might be called "mole balls", too, because one or two dropped in a mole hole will drive moles away from their garden dugouts.

Government scientists warn that wart growths on cattle, which reduce the value of hides as much as 25 per cent., are infectious and should not be ignored by cattle growers.

The naval stores industry was in existence many centuries before Christ, when Asiatic people manufactured pitches and oils from the gum or resin of trees along the shores of the Mediterranean.

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Science Service presents over the radio, an address

MAGNITUDES IN THE WORLD OF MOLECULES

By Dr. W. F. G. Swann, director of the Bartol Research Foundation of the Franklin Institute, Swarthmore, Pa., who has made important contributions to the new physics, and is now president of the American Physical Society.

Friday, July 3, at 2:45 P. M. Eastern Standard Time

Over Stations of

The Columbia Broadcasting System

PHYSICS

16,000,000 Volts From Skies To Produce Super X-Rays

With Greater Potentials Ready, German Scientists Test New Rubber, Paper and Metal Tube at 2,600,000 Volts

THE PRODUCTION of X-rays as penetrating as cosmic rays, with voltages of sixteen million, was forecast to the American Association for the Advancement of Science in Pasadena when a report from Drs. F. Lange and A. Brasch of the University of Berlin was read by Dr. Alexander Goetz of the California Institute of Technology.

Working in a small valley between two mountain speaks in northern Italy, a place where thunderstorms occur frequently in summer and early autumn, Drs. Lange and Brasch emulated the famous early American scientist Benjamin Franklin, by snatching electrical energy from the skies. With their gathering system, suspended from heavily insulated hemp ropes strung across the valley, they obtained discharges of electricity which sparked 55 feet and measured sixteen million volts.

Assured by these experiments on Monte Generoso that nature would provide the high tension electrical discharges for their experiments, Drs. Lange and Brasch returned to their laboratories at the University of Berlin to construct a new type X-ray tube, which would withstand such powerful discharges. They succeeded in building a tube of alternate rings of paper, rubber and aluminum which has been tested at 2,600,000 volts, continuing for an interval of a millionth of a second.

Most Powerful Yet Produced

These 2,600,000-volt X-rays are the most powerful yet produced, exceeding any so far produced in America. Electrons are so speeded in this tube that they drill holes an inch deep in a brass plate.

The new X-ray tube, made of rubber and metal instead of glass, is less than a dozen feet long, despite the high voltage it withstands. It is estimated that an ordinary X-ray tube to withstand such voltages would need to be 50 feet long.

When a tube now building has impressed upon it the high potentials of the natural electrical discharges at the mountain laboratory, there will be produced gamma rays equivalent to a hundred thousand grams of radium, which is at least a thousand times as much radium as there is now available.

When this experiment is performed, the super-X-rays obtained will equal the cosmic rays in penetration and the experiments projected should settle the question of the nature of the cosmic rays. X-rays produced with 2,600,000 volts in the Berlin laboratories have already penetrated lead a yard thick.

In their work on the new type X-ray tube Doctors Lange and Brasch discovered that the most effective tube is short and crooked, so as to break up surface effects along which the voltages could leak. For this reason they made the doughnut-like layers of paper insulation, rubber and aluminum of the tube of different diameters inside.

Instead of using a hot cathode source of electrons to be speeded up in the X-ray tube, the scientists actually obtained sufficient electricity for their purpose from a small porcelain tube that is normally regarded as an insulator.

In another respect they flouted previous experience. Instead of using a high-grade oil for insulating their very high voltages they found that old automobile crank-case oil would do, and then finally used plain water, which theoretically is just what should not be used.

In Berlin a new seven-million-volt surge generator is being built to be used on a Lange-Brasch tube of that voltage. This tube will be devoted to cancer research and physical experimentation.

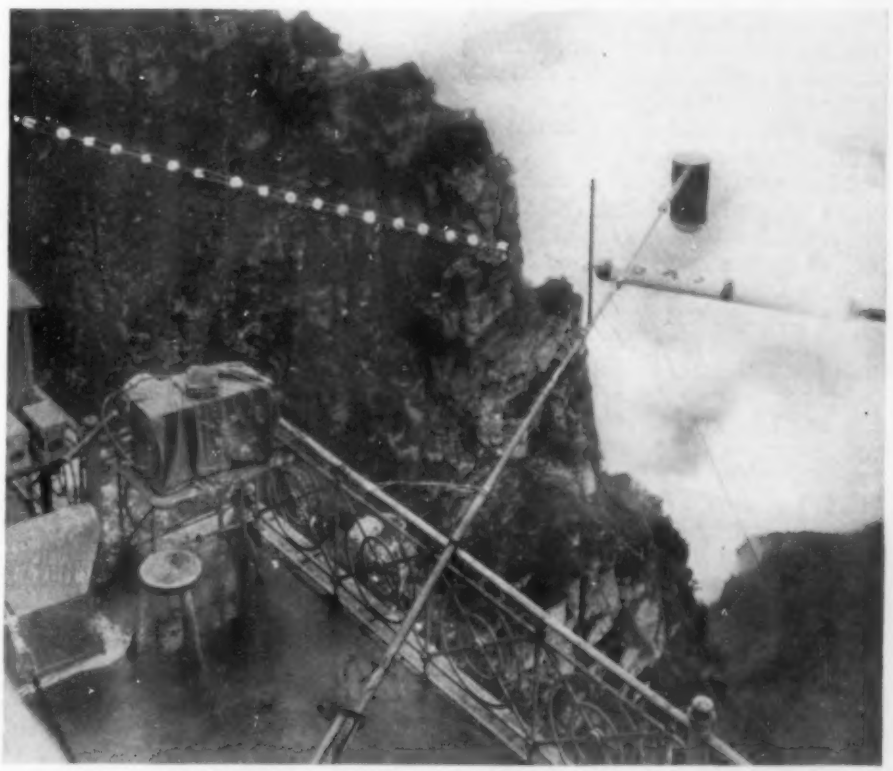
Science News Letter, June 27, 1931

ENGINEERING

Used Oil Proves Superior In Auto Operation Tests

DON'T change the oil in your car, if you want the best lubrication.

This may sound contrary to general belief, and it is contested by many engineers, and yet tests on more than 250 trucks by a large telephone company have found it to be the best policy, it



COLLECTORS OF ATMOSPHERIC ELECTRICITY *Wide World*

Hollow cylindrical conductors instead of wire of small diameter are used to collect electricity in the storm-infested area because charges do not leak readily into surrounding atmosphere from large conductors.

is shown in a report of A. C. Aston of Washington, D. C., to the Society of Automotive Engineers.

Draining oil does not remove coarse material in the crankcase, Mr. Aston believes. Draining removes oil which has been used so long in the engine that it has found its proper balance and become perfectly stabilized. It is discolored, that is true, but the discoloration is not in the slightest harmful, according to Mr. Aston, because it is merely the result of smoke which has found its way past the pistons. An engine operates worse on new oil. For oil, it is said, gains efficiency with practise, and after a few thousand miles the flash and fire points and viscosity become stabilized to suit the engine.

Used oil is better during temperature changes, the report states. It has the proper consistency, and in winter when the engine is hard to start, it circulates more easily and causes less strain than new oil.

Science News Letter, June 27, 1931

MEDICINE

Tonsils, Once Held Useless, May Prevent Diphtheria

TONSILS, long considered to be useless vestiges of an earlier evolutionary stage, may possibly have some present use after all.

Studies indicating that they may secrete something that neutralizes diphtheria toxin were reported recently, by Dr. Istvan Bezi of the Royal Hungarian University of Budapest, who spoke before the American Association of Immunologists at Cleveland. The studies are as yet only in a preliminary stage, and Dr. Bezi warned against expecting immediate application of his discovery in the treatment of diphtheria.

It has never been clearly known exactly what becomes of the toxin of diphtheria as it is formed in the throat of an infected individual. Dr. Bezi suspected that the toxin might be neutralized by the tonsil fluids or by the ordinary saliva of the mouth.

His investigations proved that the saliva may affect the diphtheria bacillus itself but will not diminish the potency of the toxin secreted by the organism. The extracts prepared from the tonsil, however, are capable of destroying or neutralizing the toxin.

Other studies of diphtheria toxin were reported by Dr. Augustus Wadsworth, director of laboratories at the New York state health department, and Ella N. Hoppe. They have found that exceedingly minute amounts of diphtheria toxin may be destroyed or neutralized in some unknown manner by tissues in culture outside of the body. These tissues will neutralize the toxin only when they are alive and not when they are dead.

As tetanus or lock-jaw toxin, which has a special selective action on nerve tissue, is found to be neutralized when mixed with a suspension of brain tissues, so diphtheria toxin, which has a special action on heart tissue, might also be supposed to be neutralized by mixing it with heart tissue; but this was not found to be the case. Diphtheria toxin mixed with ground-up heart muscle from the guinea pig retained its potency unchanged.

It was also reported that extracts of the leucocytes, white blood cells, from human blood had no power to diminish the strength of diphtheria toxin.

In general, Dr. Bezi showed that the lymph glands and tonsils possess the property of absorbing and neutralizing diphtheria toxin and in this capacity constitute our defense mechanism against this most deadly substance.

Science News Letter, June 27, 1931

PHYSICS

X-Rays are Most Destructive To Young, Growing Cells

X-RAYS in sufficient doses are destructive to all kinds of living cells, but they are most destructive to cells that are physiologically young and active.

This is one of the basic physiological facts that underlie radiotherapy, Dr. Arthur U. Desjardins of the Mayo Clinic told a meeting of the American Association for the Advancement of Science in Pasadena. It follows from this principle that tissues that remain "chronically young" respond to X-ray dosages much smaller than those needed for effect on maturer tissues.

The most sensitive of all the cells in the human body are certain classes of white blood corpuscles, and the glands and other tissue masses where these are found most thickly are also very sensitive to the destructive rays. Dr. Desjardins inclines to the opinion that the easy destructibility of these white blood cells is at the bottom of the value of X-ray therapy in certain inflammatory conditions. White blood corpuscles crowd around foci of infection, causing inflammation. The X-rays break them down, releasing the germ-destroying substances they have formed within themselves, and thereby hastening the death of the trouble-causing bacteria.

Certain kinds of tumors and cancers can be treated with X-rays because the cells constituting them are physiologically younger than the surrounding tissues. The diseased growths are therefore destroyed by doses of X-rays that do no appreciable harm to the healthy tissues.

The most sensitive of normal body tissues are the mucous surfaces lining the digestive and certain other cavities. Muscle, bone and nerve tissues are among the most resistant.

Science News Letter, June 27, 1931

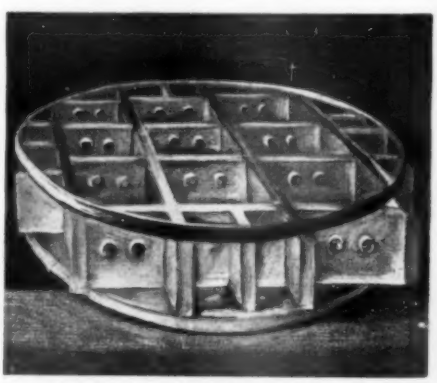
ZOOLOGY

Bumper Crop of Bear Cubs Reported in Yosemite Park

A "BUMPER CROP" of bear cubs is reported in Yosemite National Park this year. This is a great contrast to last spring, when hardly a cub was seen in Yosemite Valley.

The special bear patrol is still functioning, and any bears which damage cars or tents, or are in any way a nuisance, are caught, daubed with white paint for identification purposes, and removed to the lower end of the Valley.

Science News Letter, June 27, 1931



MIRROR OF THE FUTURE

A model of the mirror that Prof. Ritchey has designed for telescopes of the future. It is built up of a number of glass plates carefully cemented together.

ASTRONOMY

Telescope With New Features Will Take Best Star Pictures

40-Inch Instrument Planned by Prof. Ritchey Expected To be Superior to 100-Inch Reflector for Many Purposes

THE NEW 40-inch reflecting telescope, which is to be built at the U. S. Naval Observatory, Washington, D. C., though smaller than some existing instruments, will be the most perfect means in the world for photographing the stars. So says Prof. George W. Ritchey, noted telescope designer, who is to be in charge of the design and construction of the instrument.

Revolutionary methods of design and operation are expected to make the new telescope of even greater scientific importance than the huge hundred-inch reflector of the Mount Wilson Observatory in California, the optical parts of which were also designed and constructed by Prof. Ritchey.

New mathematical principles will permit this reflecting telescope to give a large field of sharp images, and at the same time to be only half as long as the present type reflector. The telescope is the invention of Prof. Ritchey and Prof. Henri Chrétien, professor of theoretical optics at the Sorbonne and at the Institute of Optics in Paris.

The contract price of the instrument is $76,000. This is not as great as the cost would be were the telescope designed like instruments now in use.

Newton's telescope, on which present reflecting instruments are based, consisted of a large concave mirror at the end of a long tube. This reflected the light back towards the stars, and the converging rays were deflected out to the side of the tube by a flat mirror placed near the top. Prof. Ritchey uses a convex curved mirror in place of this flat one. The curves of both of his reflectors are new to mathematicians.

Mere size, Prof. Ritchey says, does not give the most accurate means of photographing the stars. Actually the large domes necessary to house these giants are troublesome and expensive; and when pointed far off the zenith the long telescope tubes tend to sag.

The main object of the design of the optical parts of the 40-inch Naval Observatory telescope, according to Prof. Ritchey, is to secure by means of two reflections a large field which is sharply covered all over. Telescopes in use now give sharp images of the stars at and near the center of the field at which they are pointed, but neighboring stars are more or less blurred. The planned telescope will cover an angle of 90 minutes diameter with sharp definition, as compared with ten minutes given by the Mount Wilson instrument.

Special Photographic Plates

The photographic plates used will be round, seven and one-half inches in diameter, and slightly concave in form. They are to be ground and polished by Prof. Ritchey himself, true to one fifty-thousandth of an inch. The plates ordinarily used for photographing the sky are comparatively uneven in surface and have a thick emulsion on them. A special feature of Prof. Ritchey's technique is that the photographic emulsion used is ten times thinner than usual and has a granulation of the silver bromide particles twelve times finer. By these means rays can be brought to an accurate focus over the whole plate.

Present methods of astronomical photography, Prof. Ritchey says, do not make use of the full optical power of existing instruments. Only 10 per cent. efficiency is obtained with even the best instruments. Ninety per cent. is the efficiency expected of the new-type instrument. To give one illustration, the new telescope will focus to one ten-thousandth of an inch, whereas present methods permit accurate focusing to one hundreth of an inch.

The total length of the Washington instrument will be only ten feet, four inches. All the moving parts will float in mercury and the friction will thus be reduced nearly to zero.

In an interview with Science Service, Prof. Ritchey disclosed some of his hopes for the telescopes of the future. The reflectors of these will not be solid masses of glass like those of the present telescopes. They will be built up in cells from comparatively thin, selected plates of glass, cemented together to form the required surface.

A light, rigid, ribbed structure is formed and special plates cemented to it front and back. This honeycomb is hollow and can thus be ventilated. Discs of five to ten meters, or about fifteen to thirty feet in diameter, can be made successfully by this method, it has been shown already by the construction of large models.

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TELESCOPE BUILDER EXAMINING A SOLID MIRROR

This is the mirror used in the instruments that scan the heavens today. To make solid mirrors for the larger telescopes is a very difficult undertaking, and to overcome this disadvantage Prof. Ritchey has designed the cellular mirror pictured on page 404.

PSYCHOLOGY

Personality From Ink Blots

Stimulated by Queer-Shaped Figures, One's Imagination Will Reveal Secrets of Character to the Psychologist

By JANE STAFFORD

DO YOU SEE pictures in clouds or in the embers of the campfire? You probably do, for this is a universal tendency of mankind.

Psychologists would like to know what you see in the clouds. How people interpret forms or shapes is of particular psychological interest because it tells so much about how the mind works.

Psychologists would like to know, for instance, what a new-born baby sees when he looks at a chair for the first time. Does he see legs and a seat and a back, and maybe arms? Unless he has seen someone sit on it, he cannot know that it is meant for a seat. Does he interpret the shape of the chair as a whole or does he see the legs and other details?

When you look for pictures in clouds, do you consider the clouds as a whole or do you concentrate on the details?

Clouds are so fleeting that they cannot be used for psychological testing. Embers are equally unsatisfactory for this purpose, since no two people can be sure they are seeing the same thing. But one psychologist, Dr. George V. Dearborn of the U. S. Veterans Hospital in the Bronx, New York, decided ink blots would be a good substitute.

At first, ink blot interpretations were considered useful for showing how the normal mind worked. Then a Swiss psychologist, Dr. Hermann Rorschach, thought of using them as an aid to the study of people whose minds were not normal. It appears now that the pictures you see in clouds or ink blots are a revelation of your personality.

How you interpret the form of the clouds or of the ink blot designs depends in part on your experience. The baby, for instance, has no past experience to draw on when he is confronted for the first time with a chair. But when you look at one of the ink blot designs, you will see in it the picture of something you have seen before, or at least have heard described before.

If you are an imaginative person, that will show up in your interpretation of the ink blots. In fact, Dr. Rorschach claimed that from the ink blot test alone he could diagnose personality. He even proved this by making "blind" diagnoses which were checked against the findings of psychoanalysis. Dr. Rorschach's diagnosis with nothing but the patient's name and response to the ink blots to guide him was the same as that of the psychiatrist who had made the careful psychoanalytical study.

Personality is as important and interesting to the psychologist and the psychiatrist as it is to the movie director. To the psychologist and psychiatrist, however, personality means something more than "It."

One psychologist has said "Personality is ourselves as others see us." It is made up, in part at least, of your environment, your past experience, your training and your consciousness of self.

Hardest Diseases to Treat

The psychiatrist is always trying to find out more about personalities. The hardest diseases to treat are diseases of personality. When the germ of an infectious disease is discovered, with its transmitting agent, it is comparatively simple to bring that disease under control. With diseases of personality, the matter is much more complex. The cause may be in the patient's environment or his past experience or his early training. It may be in the way he thinks of himself or the way he feels about other persons or things. The search for the cause of personality diseases has led to the development of personality tests, among them interpretation of ink blot designs.

In these tests, unlike intelligence tests, there are no right or wrong answers. By giving the same test to many people the psychiatrist learns that certain types will respond in a certain way. You can amuse yourself by writing down what pictures you see in these ink blots taken from Dr. Dearborn's and Dr. Rorschach's sets. Does your picture include the details or merely the general outline? Is the picture you see a stationary object or does it have motion in it?

ORIGINAL INK BLOTS

Dr. Dearborn used them in his first tests. No two persons agreed on what the top one was and most thought the second a man with an upturned coat collar. Time yourself on how fast you see a picture in one of these blots.

Time yourself to see how quickly you see a picture in a given design, and then compare it with the time made by someone else you know. Of course, it would take a trained psychiatrist to interpret your responses, but you may find an inkling of your tastes and habits in them.

Colored Dots Used

The original suggestion for using ink blots as a psychological test was made by Dr. Dearborn when he was a young assistant in the philosophy department at Harvard University. Later the ink blots became more elaborate. Color was added and in the Rorschach test, the designs are no longer in silhoutte, but are shaded, with details added inside the original design.

The subjects of Dr. Dearborn's first ink blot study were mostly students in the Harvard psychology laboratory with some professors and their wives and one Latin-school girl.

"In the case of every subject some brief sketch of his or her early life was obtained as regards familiarity with various animal forms, and concerning fairy stories, mythology and the like, and as regards possible habit of watching clouds and other natural forms as a pleasure of the imagination," Dr. Dearborn reported.

"It was expected that subjects raised on a farm, hunters and artists would have a store of advantage over those of contrary habits.

"Among the subjects were two poets and two artists, and all of these were well toward the top in readiness and variety of response. One of these two poets made the shortest average of times and the subject who had the longest average is a young man very little fond of verse."

Dr. Dearborn noticed in some cases periods of inhibition when the subject could not see any resemblance in the blot to any object. This might last for a minute or two. It seemed to be like cases of inability to remember words. In the latter condition the brain paths or currents representing words are blocked, while in the inhibitions during the ink blot tests, the blocking seemed to be among the brain paths or currents representing objects.

There was great variety in interpretation of the blots. On one of the blots no two persons agreed. On another, four-fifths of the subjects saw the familiar figure of a man with upturned coat collar. These were the two extremes.

The same blot that was a "cabbage head" to one person was "an animal with his mouth open" to the next and a "fairy on a cloud" to a third. A professor was reminded by a blot of "half a sweet pea blossom" and his wife of a "snake coiled around a stick."

"It is clear that, as a general principle, the experience, and especially the early experience, of the subject has important influence," said Dr. Dearborn. "For example, study of the records shows that one subject, a purely domestic woman, is reminded most often of domestic objects; while another, who is an artist and student of mythology, sees in the blots many picturesque and fanciful things. The difference between the imaginations of the country and city bred is clear."

Study Memory Processes

Besides studying imagination, Dr. Dearborn used the ink blots to study memory processes. For this a series of 126 blots was made. The blots were shown right side up, upside down, and one-quarter and three-quarters turned. They were also shown as they would appear in a mirror. The subject was asked whether he had ever seen the design before.

DR GEORGE V. DEARBORN

He would have used clouds, but he couldn't make them stay still. So he invented ink-blot tests.

"An object upside down appears more natural than when turned on its side or seen in a mirror," Dr. Dearborn reported he found from this test. "One-quarter reversal toward the left is more favorable than three-quarter reversal; while least favorable of the six positions compared in these experiments is the inverted mirror-reversal, most rarely encountered of them all in general experience."

The Rorschach test goes much further than this, and besides depicting your imagination and memory, actually reveals your personality. It is said to be the only test which shows the emotional life of the individual. It gives a sample of what you are likely to do in a given situation. From your response to the Rorschach test, the psychiatrist can predict your behavior.

American psychologists are at present working with the Rorschach test with the idea of determining just what its value is and how it may be used to diagnose diseases of personality.

E. Fonseré, Atlas élémentaire des nuages

AN ANVIL CLOUD TO THE WEATHER MAN

But to a thousand other people it may represent a thousand different objects, revealing a different trait of character about each person.

This article was edited from manuscript prepared by Science Service for use in illustrated newspaper magazines. Copyright, 1931, by EveryWeek Magazine and Science Service.

PALEONTOLOGY

Prehistoric Rabbits Sought In Fossil Deposits

A HUNT for the world's oldest rabbits is under way at the California Institute of Technology, Pasadena. Eustace L. Furlong, curator of vertebrate paleontology, and R. W. Wilson, graduate student, are undertaking the quest of two-million-year-old bunnies.

The scientists are digging into a mound of sedimentary dirt, rich in fossils, which was brought here by its discoverers from Denio, in the northwest section of Nevada, and from it have been removed many bones which have added to the comprehensive study of prehistoric rabbits.

The specimens are being compared with recent finds made in Mint Canyon, near Saugus, northeast of Pasadena, by Prof. Chester Stock, of the California Institute of Technology, the late Prof. W. D. Matthew of the paleonotology department of the University of California, and Dr. John H. Maxson, of the Los Angeles Museum. Here were found abundant remains of rabbits, peccaries, antelopes, camels and extinct horses, together with large tortoises.

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PHYSIOLOGY

Gland Extract Used For Disorders of Youth

A VARIETY of disorders of youth ranging from serious misbehavior to slowness of growth have been treated effectively through the use of the hormone extract of the parathyroid glands, Dr. Walter Timme of New York City, reported to the Association for the Study of Internal Secretion at Philadelphia. His patients, who were adolescent boys and girls, were suffering from deficiency of calcium.

The young sufferers complained of symptoms varying from undue fatigue and slowness of growth to extreme conduct disorders. Physical examination showed extreme nervous irritability which resulted in the behavior disorders.

"These patients were inordinately affected by environment changes, temperature variations, noises and disturbances of all kinds," Dr. Timme said. "Opposition and criticism irritated them and they reacted rapidly to them. One of our patients, in such a moment of disturbance, threw his sister out of the window because of some slightly disparaging remark she had made. Immediately after the act, contrition arises, but too late. Thus arise many criminal cases, assaultive and homicidal in character.

"Another group is composed of those who show quickness and alertness in responsive speech, in other words are witty. These witty responses are almost never the result of thought processes but are due to rapid awakening of associations of many kinds, and the retort is actually made before the talker is aware of what he has said."

Dr. Timme found that these patients were not benefited by being given calcium alone, because their mechanism for utilizing this vital salt was functioning below par. When he gave them the parathyroid gland extract with doses of calcium they recovered.

Science News Letter, June 27, 1931

MEDICINE

Viosterol Found Beneficial In Radium Poisoning

ALMOST simultaneously with the news of the twentieth death from radium poisoning among the unfortunate watch factory workers, comes the announcement of a promising method of treating the condition. Viosterol, now often given children in place of cod liver oil to prevent or cure rickets, has benefited a number of victims of radium poisoning, Dr. Frederick B. Flinn of Columbia University, New York, has reported to the American Medical Association.

Because radium is related to calcium, it was supposed that any treatment that would affect calcium might have a similar action on the radium deposits, Dr. Flinn explained. So he first tried treatment with an extract of the parathyroid glands. These small glands, located behind the thyroid in the neck, are thought to regulate the calcium of the body.

Parathyroid treatment had been moderately successful, when Dr. Flinn suggested the use of viosterol. Vitamin D, calcium utilization in the body, bone formation and the parathyroid glands are all linked together, so viosterol, which is a potent source of vitamin D, was a logical selection.

The results of this treatment in eight cases have been good. In two cases, radium was completely eliminated from the body. In the other six the amount of radium was materially reduced.

Science News Letter, June 27, 1931

IN SCIENC

GEOLOGY

Newly Emerged Islands Not From Lost Atlantis

THE "LOST ATLANTIS" theory of the origin of the tiny scraps of new land that have emerged near St. Paul's Rocks in the middle of the South Atlantic off the coast of Brazil is scouted as utter nonsense by Dr. Henry Washington, volcanologist of the Carnegie Institution of Washington. Dr. Washington recently completed a critical study of rocks from the St. Paul group, and is perhaps better acquainted than any other scientist with the structure of the earth's crust in that little-visited part of the world.

Scientists have a pretty good idea of the depth of the ocean over all its extent, Dr. Washington explained. There is nothing to indicate a sunken continent, but there is a most peculiar submarine ridge running down the length of the Atlantic, splitting the ocean into an eastern and western half. It is like a great mountain range, with only the highest peaks emerging as islands.

These emerged peaks are familiar to us as the islands and island groups of the Azores, Ascension, Tristan da Cunha, St. Helena, Gough, Bouvet, and St. Paul's Rocks. The newly emerged islets, if they stay above the surface, will add another lower summit or two to the dry part of this sub-Atlantic mountain range.

Science News Letter, June 27, 1931

ENGINEERING

Single Telephone Operator To Give Whole City Time

A SINGLE telephone operator will soon be able to give the correct time to a whole city by means of new equipment devised by the Bell Telephone Laboratories in New York.

Every quarter of a minute a tone signal sounds in a circuit into which all inquiries for "Correct time, please," are plugged. Just before the time signal sounds a special operator speaks and tells the exact time to be announced.

Science News Letter, June 27, 1931

NCE FIELDS

MUSEUMS

Museum Budgets Increase To Nearly $17,000,000

INTEREST of the American public in the educational material displayed in museums has increased enormously in the past 25 years, if one may judge by the increase in the annual budget used by these institutions.

In 1906, the total amount spent by all the museums of the country was $3,000,000. Today, the annual budget amounts to $16,900,000. These figures have been made public by Dr. Laurence Vail Coleman, director of the American Association of Museums, Washington, D. C., in a report to the Association.

A recent development of museum work which has attracted wide interest is the construction of small outdoor museums or "trailsides" in the state and national parks for the purpose of giving instruction in natural science to the tourists who visit there.

Science News Letter, June 27, 1931

PHYSICS

Electron Waves Will Reveal Structure of Crystals

WAVES of electrons will soon allow the scientist to obtain a clearer picture of the internal structure of crystals than ever before possible, Dr. C. J. Davisson of the Bell Telephone Laboratories, New York, predicted to the American Association for the Advancement of Science and the American Physical Society in Pasadena.

Very short wavelengths are available in electron waves and this results in greater power to photograph the fine crystal structure of matter. Dr. Davisson is a pioneer in the use of electron waves since he won international fame a few years ago by proving that electrons acted like waves in much the same way as light and X-rays. He has also developed lenses for concentrating the beam of electrons. Since the electron may be termed a particle of electricity, his work bridges the previous gap between matter and electricity.

Just as shortening the wavelength of light used in illuminating a microscope allows smaller objects to be seen, use of electrons made visible by their effects on photographic plates allow physicists to study more minute structure in crystalline matter, Dr. Davisson explained. The electron waves are diffracted by crystals and give rise to diffraction patterns which are quite similar to those produced by X-rays. X-ray studies have given much information on matter's structure in the past decade.

The scattering power of atoms is about a million times greater for electron waves than for X-rays, Dr. Davisson explained. The electron waves will therefore give information chiefly regarding the structure of surfaces of crystals, whereas the X-rays give information about the structure of the bodies of crystals. He also expects that the electron waves will allow the study of layers of gas attached to the surfaces of metal crystals.

Science News Letter, June 27, 1931

MEDICINE

Artificial Antitoxins May Fight Diseases

THERE IS HOPE that eventually artificial specific protective substances superior to those formed during natural convalescence from disease may be produced in the chemical laboratory and may become the main therapeutic instruments in the prevention and treatment of microbic infections, Dr. W. H. Manwaring of Stanford University told the American Association for the Advancement of Science in Pasadena.

He explained that numerous specific antitoxins and other protective antibodies have already been synthesized in the laboratory, with the possibility that in time such syntheses will be so perfected as to be of clinical value.

Up until five years ago the generally accepted theory of specific bodily defense against disease was that proposed by Dr. Paul Ehrlich, who assumed that a minute sample of a specific chemical defense against each and every microbic infection is preexistent in normal human flesh, together with a physiological mechanism for its emergency increase in times of specific need.

Dr. Manwaring and Dr. A. P. Locke of Chicago, working independently, discovered that many new, previously nonexistent specific biochemical defenses are synthesized as a result of interaction between infections and tissues of the body.

Science News Letter, June 27, 1931

SURGERY

Operation Saves Victims Of Mercury Poisoning

AN OPERATION which will save the lives of persons who have swallowed the deadly poison, bichloride of mercury, has been described by Dr. Samuel Berger of Cleveland. The operation is called cecostomy and consists of an opening into the cecum, which is a sort of dilated pouch into which open the large and small intestine and the appendix.

Dr. Berger and associates, Drs. H. S. Applebaum and A. M. Young, examined carefully the bodies of persons who had died by poisoning with bichloride of mercury. They found that gangrene developed in the lower intestine in a large percentage of patients who lived beyond the first 24 hours after swallowing the poison. This gangrene was responsible for the deaths of these patients.

The treatment which Dr. Berger and associates then instituted consisted of a constant flushing of the gastro-intestinal system with water through the opening made by the cecostomy operation. This flushing interrupts the passage of the poison from the stomach to the colon and averts the development of gangrene.

The procedure is only successful when performed within a few hours after the poison has been swallowed, Dr. Berger emphasized. Patients in whom it was carried out after two days or more all died.

Science News Letter, June 27, 1931

ENTOMOLOGY

Capper Agricultural Award Goes to Foe of Insects

FOR distinguished service in leading the army of science against the armies of insects that threaten man's crops, his forests, his house and his health, Dr. L. O. Howard, former chief of the Bureau of Entomology, U. S. Department of Agriculture, has been designated to receive the Capper award for 1931. This award consists of a gold medal and a cash purse of five thousand dollars. It was founded by Sen. Arthur Capper of Kansas, and is given each year to a scientist who has made notable contributions to the progress of agriculture. Last year's Capper prizeman was Dr. S. M. Babcock of the University of Wisconsin.

Science News Letter, June 27, 1931

ENGINEERING

The Steam Turbine
"A Classic Invention"

Forty Years After His Invention of the Steam Turbine Sir Charles A. Parsons Described it in These Words

THE STEAM TURBINE—As a study in Applied Physics. An address by Sir Charles A. Parsons, on the Occasion of the Centenary Celebration of the Founding of the Franklin Institute and the Inauguration Exercises of the Bartol Research Foundation, September 17, 18, 19, 1924. Philadelphia, The Franklin Institute,* (1924?).

THE development of the steam turbine, to which I have directed much attention, may perhaps be taken as an illustration of a research in one class of engineering, and probably as representative of researches in many other lines of manufacture. At the outset, the collection of new data was obviously required before the general line of advance could be determined. Some preliminary experiments were made with high-speed shafts and bearings, but in order to complete these data a small turbine coupled to a high-speed dynamo of primitive design was made: The calculated stresses due to centrifugal force, the laws governing the flow of steam and data from dynamos as approximately known at that time, were taken into account. This machine was tested out on very similar lines to those followed by Joule when trying to improve the electromagnetic engine of Sturgeon. The constants for the flow of steam, the loss by friction in bearings at high surface speeds, the hysteresis and eddy current losses in armature core, conductors, and binding wire at abnormally high speeds, were approximately investigated.

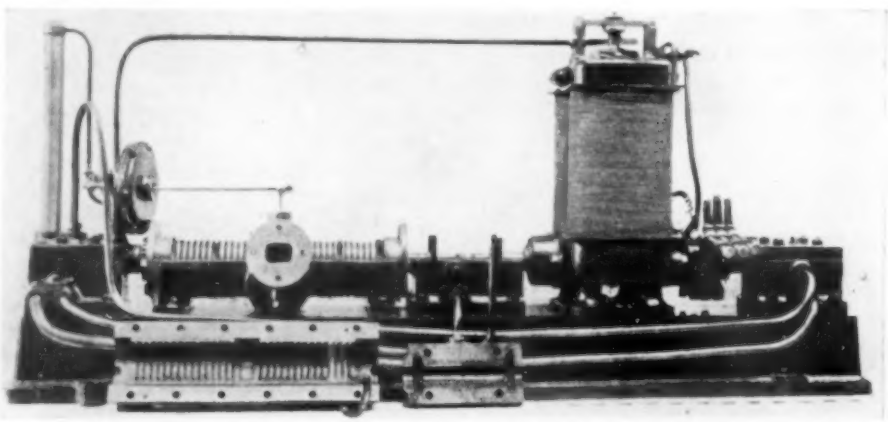
Higher mathematics were not employed in this initial work, but were used much later to coordinate the accumulated data and forecast the effect of improvements and refinements which have, in recent years, considerably increased the thermal efficiency of the turbine; as a matter of fact, it does not now appear that the use of higher mathematics in the earlier stages of development would have been useful; the accumulation of sufficiently accurate data to enable them to be practically and usefully applied would have been at that time an additional burden and a hindrance to progress. This, however, does not imply that a mathematical and physical training is not of very great value, for the two men who directed the work had passed mathematical and physical courses at universities, as well as being trained engineers. All that it is intended to emphasize is that mathematics should be used in the proper place, and in engineering and pioneer work, chiefly to consolidate the rear, assist the communications, but seldom to lead in the advance.

Turbine Stimulated Research

On the other hand, the coming of the steam turbine has had the effect of stimulating mathematical and physical research in certain directions, notably in the dynamics of rotating shafts, the law of flow of saturated and superheated steam through nozzles, and the frictional resistance to flow through passages and over surfaces, also to supercooling and other phenomena.

Present-day knowledge of both the theory and the technique of steam engines has justified Watt in the principles which he laid down. The main development of the steam engine since his time has consisted in an extension of the range of expansion and in an ever-increasing degree of compounding. The separation of the condenser from the cylinder by Watt was followed by the division of the expansion into stages in separate cylinders, finally into four stages in the highest development of the reciprocating engine. The steam turbine carries this subdivision still further, the number of stages included in a reaction turbine of high efficiency being commonly sixty or more. But whilst in the compound reciprocating engine the primary object of compounding is to reduce the temperature range of each individual cylinder, and so to diminish the condensation and loss which occurs when hot steam is admitted into a cylinder, the walls of which have been cooled to the temperature of the steam just discharged from it, in a steam turbine there is no such cyclic variation of temperature. The extensive compounding which is now adopted in all steam turbines of high efficiency is nevertheless of vital importance to their performance.

The necessity for it arises primarily from the low density of the working fluid, in consequence of which, if the steam velocity is to be kept proportionate to the linear velocity of the blades, only a small fraction of the available energy per pound of fluid can be dealt with in each stage. Since the available energy of the steam is first of all converted into kinetic energy, it follows that this must be done in a large num-



PARSONS' ORIGINAL STEAM TURBINE AND GENERATOR

*Sir Charles A. Parsons, whose improvement of the modern steam engine ranks with James Watt's improvement of the primitive one, died January 12, 1931 at the age of 76. He was the youngest son of the Earl of Rosse, the celebrated Irish telescope builder.

ber of stages. The ratio of blade velocity to steam velocity is thus easily controlled by the adoption of a suitable degree of compounding. In large turbines of the reaction type, the velocity of the blades is nearly equal to that of the steam. Under such conditions, the efficiency of reaction blading is practically equal to the efficiency of discharge of well-shaped nozzles.

Ideal For Electricity

The high efficiency of which the steam turbine is capable, the widely extended pressure and temperature range which it can utilize without mechanical difficulties, and the fact that it can be built for very large power output from one unit, have made it the ideal prime mover for electric generating stations. Fortunately, the relation between the output and speed of an alternator follows nearly the same law (the inverse square) as the steam turbine and the combination of turbine and alternator thus rapidly progressed in size to meet the demands for large units and in all large power stations using fuel, steam turbines now provide the motive power, with generating units ranging in capacity up to 60,000 kw. Some of these stations now have a total capacity of supply of 500,000 kw. feeding into widespread distribution systems and covering large areas.

In marine work, there has been a similarly rapid progress both in economy and capacity, the marine turbine having advanced in output during twenty years' development from the 2000 S.H.P. for the *Turbinia* to the 150,000 H.P. of H.M.S. *Hood*.

The first marine turbines were directly coupled to the propeller shafting, but all marine turbines built in recent years are connected to their propeller through some form of gearing. The steam turbine being essentially a high-speed engine, the association with a low-speed propeller put the marine turbine at a disadvantage so long as it remained directly coupled to the propeller shaft, so that its early development was restricted largely to the propulsion of high-speed vessels such as warships, liners and channel steamers; although in such cases the direct coupled turbine soon established its superiority over the reciprocating engine. With the introduction of mechanical gearing in 1910, the marine turbine was freed from this limitation. The turbine has now been applied for the propulsion of all classes of sea-going vessels and considerable improvement in economy effected by the increased efficiencies of both turbines and propeller when these are allowed each to rotate at its most efficient speed. The general result is that steam consumptions have been reduced to less than one-half of that of the early direct coupled turbines.

Whilst mechanical gearing was introduced in the first place with the object of making the turbine applicable to low-speed vessels, it was found to be of value even in higher speed vessels, and the direct coupled turbine may now be said to have been completely superseded by the geared turbine in all classes of later construction.

Mechanical gearing has also assisted in the extension of the field of application of turbines on land. Continuous current generators which have been made in sizes up to 3000 kw. at moderate speeds can now be driven by efficient high-speed turbines, as also can low-frequency alternators and alternators of small or moderate output. The general turbine has also been used to a considerable extent for the driving of mills, such as textile, paper and jute mills. In these installations the high economy of the turbine and the powerful starting torque to be obtained with it are of great value, and so also is the uniform turning moment of a turbine drive of particular advantage in mills where the power is transmitted to the different floors by ropes.

Now, let us consider the theoretical position of the steam turbine. At the present time, the materials at our disposal do not allow in practice a higher temperature than about 750° F. for the superheater, and it has become necessary to search for means of increasing the efficiency of the thermodynamic cycle without increasing the maximum steam temperature.

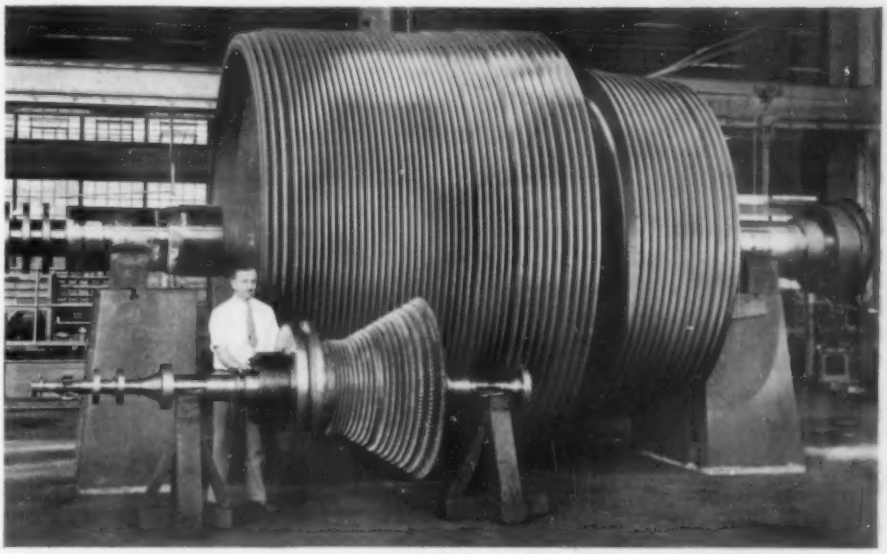
To Increase Efficiency

There are at least four different ways of doing this. These are as follows:

(1) Diminishing the amount of heat thrown away in the condensing water, by utilizing steam withdrawn from the turbine for heating the boiler feed water.

(2) Increasing the mean temperature of heat reception by increasing the boiler pressure.

(3) Increasing the energy and the stage efficiency of the low-pressure part of the expansion by reheating the steam after partial expansion.



GIANT AND PIGMY DELIVER SAME HORSEPOWER

Turbine development has proceeded apace since Sir Charles A. Parsons' first machine. This picture from the Westinghouse shops shows spindles for turbines that will drive U. S. battleships. In spite of their difference in size both deliver 7000 horsepower, but the large one turns at 240 revolutions per minute and the smaller at 3600.

"The Man With a Lid on His Stomach"

was the subject of a famous series of experiments which revealed the mechanism of digestion and the nature of gastric juice.

Dr. William Beaumont

describes gastric juice in

THE NEXT CLASSIC OF SCIENCE

(4) Arranging the exhaust and portions of the blading so as to expand the steam efficiently to the highest vacuum obtainable in the condenser.

Considering these proposals in the order given above, it will be evident, on theoretical grounds, that the necessity to heat the feed water, in other words, to reheat the water of condensation before conversion at constant temperature into steam, is the defect of the Rankine cycle; because it involves heat reception at temperature below the maximum.

Since the steam in the course of its expansion through the turbine is all the time falling in temperature, it is clear that this defect could be overcome if the heating of the feed could be accomplished by transfer of heat from the steam at corresponding stages of equal temperature, or, in other words, by a regenerative process. With the addition of such a process, the cycle would be thermodynamically reversible, and under such conditions, the efficiency of the Rankine cycle for saturated steam would be brought up to that of the Carnot cycle. In practice a close approximation to this regenerative process can be obtained by the employment of a sufficient number of feed-water heaters in cascade supplied with steam tapped off from suitable stages of the turbine.[1] The steam which thus transfers its heat to the feed heater is first of all made to do some work by expansion in the turbine down to the temperature at which it is required for withdrawal to the corresponding heaters, and since a certain amount of heat is required for the feed water in any case, the work obtained from this tapped-off steam is obtained merely at the expense of additional heat equal to the work done by it, in other words, this additional heat is utilized at nearly 100 per cent. efficiency. Expressed in another way, the utilization of some of the heat of the steam to preheat the feed water reduces the amount of heat that has to be taken in by the boiler and also that rejected to the condenser.

[1]Feed heating in a single stage by partly expanded steam is a well-known expedient. It was proposed by James Weit in 1876 and by Normand in 1889; and feed heating in progressive stages was proposed by Ferranti in 1906.

Science News Letter, June 27, 1931

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SEISMOLOGY

Automatic Seismograph Works Only When Quake Starts It

HOW SEISMOGRAPH instruments of a new type, cheaply constructed and starting automatically to register only when an earthquake rocks the actual spot where they are standing, are being planted at various points in California to "trap" earthquakes when they happen, was told before the meeting of the Seismological Society of America in Pasadena last week by Prof. R. R. Martel of the California Institute of Technology. Prof. Martel read a report from Capt. N. H. Heck of the U. S. Coast and Geodetic Survey, who has immediate charge of the work.

Although earthquakes have engaged the attention of scientific men for many years and delicate instruments have been devised to detect them at a distance and tell how far away and how violent they are, strangely enough there has not been until the present time any instrument that could make a record of an earthquake occurring in the immediate neighhood. They are so delicately built that a strong earthquake directly under them would wreck them. The new instruments are more ruggedly built, record only relatively large earth movements near by, and turn themselves on automatically when a quake begins.

The distribution of these instruments has been undertaken by the Federal government largely as a practical aid to engineers and architects in designing and placing buildings so as to avoid earthquake damage as far as possible. California was not chosen as the first area to be investigated by means of the new instruments because it is the most probable scene of great earthquakes, Captain Heck said.

Science News Letter, June 27, 1931

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PHYSICS

Alpha Particle Tetrahedrons Build Up Atom Nucleus

Prof. Latimer Summarizes Knowledge of Heart of Matter And Presents New View Satisfying Present Information

SCIENTISTS were given a look into the heart of matter and shown diagrams of the structure of the atomic nucleus when Prof. Wendell M. Latimer of the University of California presented to the American Association for the Advancement of Science meeting at Pasadena, Calif., a new theory of the way in which the central portion of the atom is put together.

This is the ultimate and final step determining just what is the structure of the material things about us. In the past few years scientists have carried their probings into the makeup of matter step by step into the realms of the minute in size. Beneath the seemingly solid surfaces of metals and other substances with which we have daily contact, they first found a multitude of regularly arranged crystals, row on row of them, each made up of molecules, which in turn were shown to be definite arrangements of atoms. X-rays have aided greatly in this exploration of submicroscopic crystal worlds. The atom was shown to be fashioned as a very heavy nucleus surrounded by very light particles or waves known as electrons. Prof. Latimer has assumed the task of discovering the architecture of that internal citadel of the atom which has kept out prying scientific explorers.

Previous investigators have pictured the nucleus of the atom in terms of the number of protons, or hearts of hydrogen atoms, and electrons that are present, Prof. Latimer explained. In iron, for instance, the nucleus was known to consist of 56 of the protons, as the hydrogen nuclei are called, and 30 electrons or units of electricity. The radio-active disintegration of elements like radium gave a clue to how the protons and electrons were arranged in the nucleus. Disintegrating matter gives off both unattached electrons in pairs and bundles of four protons and two electrons known as alpha particles. These particular bundles known as alpha particles are known to be also the atomic hearts of helium, the inert gas that is used to inflate American airships.

Other research has shown that these protons and electrons are spinning and opposite spins play an important part in keeping the nucleus together.

These were the materials used by Prof. Latimer in building together his new view of the heart of matter. First he arranged alpha particles in a tetrahedral pattern, that is, at the corners of a triangular pyramid. Then he assumed that each of these alpha particles is itself a tiny tetrahedron of four protons with a pair of electrons happily spinning at its center. This builds a nuclear structure that satisfies all science knows about the atomic nucleus. Prof. Latimer presented it as the best picture that can now be drawn of the ultimate in the structure of matter.

Science News Letter, June 27, 1931

ASTRONOMY

Size of Newest Planet Is Still Undetermined

ASTRONOMERS are not quite certain of the size of the planet Pluto which was discovered last year.

Dr. E. C. Bower of the University of California reported to the American Association for the Advancement of Science in Pasadena, a study of gravitational pulls between Pluto and the other members of the solar system which unfortunately does not give conclusive results. The most probable result is that Pluto has seven-tenths of the mass of the earth.

Dr. Bowers explained that an observation of the planet's disk in the hundred-inch telescope at Mt. Wilson probably offers the best chance of determining its size. Since with poor seeing conditions at Mt. Wilson no disk could be seen, Dr. Bower believes that the outermost planet of the sun's family cannot be larger than eight-tenths the size of the earth. If, under the best conditions for astronomical observations, Pluto does not appear to be more than a mere point of light, it cannot be heavier than a tenth of the earth's mass.

Science News Letter, June 27, 1931

St. Joseph's High School, Emmitsburg, Maryland—

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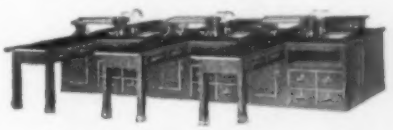

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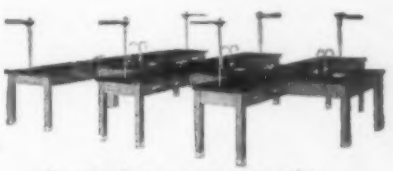

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BOTANY-MEDICINE

Chemist Describes Poison Ivy And Tells What to Do About It

POISON ivy and what to do about it was the subject of a Science Service radio talk given recently over the network of the Columbia Broadcasting System by Dr. James F. Couch, of the U. S. Department of Agriculture.

Dr. Couch, who has given much attention to this poisonous weed, said that the best thing to do about it is to keep away from it as completely as possible. The next best, if one must go where one is likely to come in contact with it, is to be ready for eventualities with a proved remedy. Such a remedy, he said, is a five per cent. solution of potassium permanganate in water. This chemical is obtainable at any drug store, is cheap and safe, and is not a proprietary or "patent" medicine.

Not Hard to Tell

It is not hard to tell poison ivy when you see it, said Dr. Couch. The poison ivy of the East and the poison oak of the West look just about alike: they are glossy-leaved shrubs or sometimes vines climbing trees by means of short roots. Their leaves are always divided into three leaflets; whence the old saying, "Leaflets three, let it be!" They have a relative, the poison sumac of the East, that looks like common sumac, but unlike it always grows in bogs and has hanging white berries instead of stiffly upright bunches of brown ones like the common sumac.

"In spite of the immense amount of chemical investigation performed on these plants," Dr. Couch explained, "the poisonous substance has not yet been isolated with certainty in a pure condition. All of these investigators obtained oily substances that were very toxic and that would produce blistering in incredibly small amounts. Pfaff named it 'toxicodendrol' and it appears to be present in all species of *Rhus* that can cause dermatitis. All parts of the plant contain this substance. The green berries are poisonous but the ripe ones do not appear to contain enough to cause blistering. Toxicodendrol is a complex substance that belongs to the group of compounds called phenols by the chemist. This group contains other members that are capable of blistering the skin but none that are so active as this from poison ivy. Since toxicodendrol is soluble in fats it readily penetrates to the lower layers of the human skin where it sets up the painful irritation so well known to its victims."

Science News Letter, June 27, 1931

An Australian explorer plans an expedition into the desert of central Australia where traditions tell of a cave containing fabulous gold treasure.

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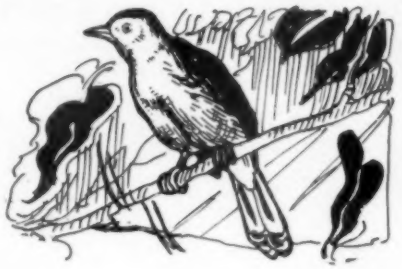
ORNITHOLOGY

Nature Ramblings

By FRANK THONE



Catbird

IF SOME morning you hear what sounds like a couple of kittens in distress you had better look into the trees round about, to see that there isn't a catbird somewhere, dodging in and out among the leaves, laughing to himself at having made a belated April fool of you.

The catbird is a long-tailed, moderately slender, sleek-feathered bird, slate-gray all over, darker on back and crown and tail than on his under side. He has a large repertoire of music other than his cat-call, which indeed is apparently uttered mainly in alarm or anger, or possibly sometimes in mischief. He is quite as able an imitator as his near relatives, the brown thrasher and the mocking-bird of the South, though his attempts at more ambitious and original melody, while good, are not so excellent as theirs. He has little fear of man, and often appears in the outskirts of cities. He builds his nest quite low, seldom more than ten feet above ground.

In two things the catbird has a bad reputation. Some naturalists accuse him of robbing the nests of other birds; and the birds themselves bear witness, for they dislike his company and frequently "gang up" to do him violence. In the Middle West he is also somewhat of a nuisance in orchards, for about half his fare consists of plant food. It is stated, however, that he really prefers wild fruits and berries, and will steal cultivated fruits only when the native supply is lacking.

Science News Letter, June 27, 1931

A train which is equipped throughout with an air-cooling and purifying system is to be put in service on an eastern railroad this summer.

ENGINEERING

Larger Mercury Vapor Electric Generating Unit Being Built

Success of Boiler and Turbine Using Mercury Instead of Steam Leads to Building of 20,000 Kilowatt Plant

See Front Cover

A NEW and larger turbine electric generator that will use mercury vapor instead of steam and will consume less fuel than corresponding modern steam plants is being constructed in the General Electric Company plant at Schenectady, N. Y.

This 20,000 kilowatt turbine will have twice the output of the mercury vapor engine and generator which General Electric engineers claim has already proved its superior efficiency over steam turbines during a year's test at Hartford, Conn. The new plant will be even more efficient than the Hartford station, it is said.

The mercury is boiled over a fire and the vapor is played on the blades of a turbine wheel as in a steam generator, but at a much higher temperature. The advantage of the quicksilver over water is due, in the first place, to its higher boiling temperature. This allows the engineer to use his mercury at as high as 950 degrees Fahrenheit without producing unusually high pressures in the boiler.

One of the most fundamental principles of physical science, the second law of thermodynamics, has been used in this invention by W. L. R. Emmet, who devised the first mercury turbine. According to this law, the greater the temperature range of a heat engine, the greater the efficiency. The difference between the temperature of the vapor coming from the boiler and the temperature of the condenser determines the temperature range of the engine.

The hot mercury vapor in the exhaust of the turbine, instead of being condensed by water, is used to evaporate water into steam for other steam turbines. This effects a further economy in fuel.

The high pressure steam thus produced is to be conveyed to steam turbines elsewhere in the plant. A 110,000 volt transmission system will be supplied by the electric generator coupled with the mercury turbine.

A quarter of a million pounds of mercury will be used in this installation, though on account of the great density of the liquid it is 13 times less bulky than the same weight of water. The world is squandering its supply of this metal, which comes from Italy, Spain and the United States, very lavishly just now. The advantages of the new turbines are so great, however, that some of the supply will certainly be diverted to constructing mercury power units to replace existing steam plants.

Fortunately none of the mercury is lost in the operation of the boiler and turbine. All joints are vacuum tight. The vapor is a very insidious poison even if breathed in small amounts.

The picture on the front cover is taken at the generator end of the unit in the South Meadow station of the Hartford Electric Light Co. It shows the electric generator, which is the dark object in the lower right, and two condenser-boilers that condense the mercury after it comes from the turbine by absorbing its heat to change water to steam for operating auxiliary steam turbines.

Science News Letter, June 27, 1931

GENERAL SCIENCE

Science's Growth Indicated By Increase in Literature

A TWELVE-PAGE weekly publication deposited with the Chemists' Club library in New York, once kept up with progress in all fields of science. Now this same library catalogues 30,000 volumes of magazines each year to cover scientific literature.

The abundance of publications devoted to scientific research is becoming a serious problem, according to a report presented the American Chemical Society by Fred B. Kilmer, of New Brunswick, N. J. At the end of a century, Mr. Kilmer said, a scientist who wants to find out what has already been done on a research problem will have to search through 3,000,000 volumes.

Science News Letter, June 27, 1931

TEACHERS COLLEGE

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• First Glances at New Books

Physics

THE DYNAMIC UNIVERSE—James Mackaye—*Scribner's,* 308 p., $3.50. Here is someone with a good background of physics and mathematics who presumes to criticise Einstein's theory without supporting his argument with mathematics. "Despite the standing of the relativity theory in our day," says Mr. Mackaye, "few physicists pretend to understand it." Mr. Mackaye is one of those who decline to be mystified by the metaphysical legerdemain of relativity philosophers and brings forward arguments to show that the man in the street and the relativist are not really talking about the same thing.

Science News Letter, June 27, 1931

General Science

THE STORY OF SCIENCE—David Dietz—*Sears,* 387 p., $3.50. One cannot learn all about science out of one book, as many persons now seem to imagine they can; but anyone desiring to get a first look at science in any of its many fields might very well begin with Mr. Dietz's book. He begins with cosmogony and astronomy and goes through in logical order to biology and psychology. Necessarily limited in its treatment of many subjects because of space considerations, the book nevertheless manages at least to touch on everything of importance in a general survey of science.

Science News Letter, June 27, 1931

Psychology

HUMAN LEARNING — Edward L. Thorndike — *Century,* 206 p., $2.25. Teachers and students, as well as psychologists, will welcome this collection of lectures on the learning process by an eminent psychologist. They contain a non-technical account of many interesting experiments.

Science News Letter, June 27, 1931

Chemistry

ANNUAL SURVEY OF AMERICAN CHEMISTRY, Vol. V, 1930—Edited by Clarence J. West for the National Research Council—*Chemical Catalog,* 629 p., $5. This fascinating technical survey of the great output of American chemists gives research workers a chance to catch up with what is going on in this science. "Chemical Abstracts" gets so bulky nowadays that a guide of this sort has become absolutely necessary. In accordance with an established policy there have been several changes this year in the list of authors and a few changes in the list of topics. Any tendencies to unhealthy crystallization of the subject are thus avoided.

Science News Letter, June 27, 1931

Physics

INTERNATIONAL CRITICAL TABLES, Vol. VII—National Research Council —*McGraw-Hill,* 507 p., $12. With this volume, the monumental collection of the latest information on all available physical and chemical constants is complete. The National Research Council is to be congratulated on its energy in carrying through this enterprise, as it was at the outset on its initiative in undertaking it. The volume concludes with a complete list of periodicals and other sources referred to throughout the set, giving with each its key number.

Science News Letter, June 27, 1931

Mineralogy

DETERMINATION OF THE OPAQUE MINERALS—C. Mason Farnham—*McGraw-Hill,* 236 p., $3.50. A handbook on the identification of minerals that cannot be examined by transmitted light. It will be useful to economic geologists, mining and metallurgical engineers and other students of ore deposits.

Science News Letter, June 27, 1931

Horticulture

PERENNIAL GARDENS—H. S. Ortloff —*Macmillan,* 88 p., $1.25. A small handbook that will be very useful to the home gardener, telling how to arrange and maintain effective beds and borders of hardy perennials.

Science News Letter, June 27, 1931

Entomology

A TEXT BOOK OF AGRICULTURAL ENTOMOLOGY—K. M. Smith—*Cambridge University Press,* 285 p., $4.25. A text intended primarily for use in Britain, but of value for reference in any country. Clearly written and cleanly illustrated.

Science News Letter, June 27, 1931

Engineering

THE LIGHTING BOOK—J. L. Starr—*Curtis Lighting, Inc.,* 316 p. Lighting problems of schools, auditoriums, libraries, banks, stores and other large interior spaces, floodlighting and other exterior effects, lighting fixtures, their design, arrangement and installation—all receive practical treatment in this well-illustrated book.

Science News Letter, June 27, 1931

Chemistry

MINERALS IN MODERN INDUSTRY—W. H. Voskuil—*Wiley,* 350 p., $3.75. Tells many things that the common man has wanted to know about the economics of coal, oil, gas, iron and other mineral products, particularly from the point of view of the United States. The discussion of these questions in technical works is usually all too brief. The present book should help to make chemists and engineers conscious of the social ramifications of their work and to make executives and laymen aware of the key position of chemical raw materials in modern industry.

Science News Letter, June 27, 1931

Photography

PHOTOGRAPHIC AMUSEMENTS—F. R. Fraprie and W. E. Woodbury—*American Photographic Publishing Co.,* 271 p., $3. The tenth and enlarged edition of a book of photographic stunts. High school pupils who enjoy using a camera will find many amusing, amazing and interesting uses for their instruments in this book. Others will enjoy examining the pictures reproduced.

Science News Letter, June 27, 1931

Engineering

MECHANICAL ENGINEERS' HANDBOOK—Edited by Lionel S. Marks—*McGraw-Hill,* 2264 p., $7. The fact that the first two editions of this book went through a total of eighteen printings is sufficient warrant to expect a similar success for the third. This chunky little book is a whole engineers' encyclopedia in itself, ranging from tables of mathematical functions to a digest of the A. S. M. E. power test codes.

Science News Letter, June 27, 1931

Biochemistry

CAN SCIENCE EXPLAIN LIFE?—C. F. Krafft—*Author,* 94 p., $1. An artificial protein or polypeptide structure when arranged in spiral form is believed by the author to be involved in protoplasm and to explain certain biological phenomena. The evidence brought forward will scarcely convince the sceptical.

Science News Letter, June 27, 1931

Radio

A. C. RADIO GUIDE—K. A. Hathaway—*American Technical Society,* 118 p., $1.50. Revised edition of a compact treatise on alternating-current radio tubes and sets and dynamic loud speakers.

Science News Letter, June 27, 1931